

# **Economic Framework for Melbourne Traffic Planning**

**Harry Clarke and Andrew Hawkins**

**M**elbourne has the size, population density and car ownership levels of many North American cities but the levels of public transport infrastructure seen in European cities. Although possessing above-average public transport infrastructure it still faces problems of dealing with high car use and socially-costly traffic congestion that amount to losses of billions of dollars annually. The costs include wasted travel time, increased stress and fatigue, excessive fuel and maintenance costs, lower worker productivity, increased transport capital requirements, reduced business competitiveness and deterioration of an otherwise aesthetically pleasing environment. Although these costs can be reduced with demand-side policies, roads are the only public utility in Victoria not targeted for efficient pricing.

In this paper, economics-based policies are proposed for ameliorating Melbourne's traffic congestion. A suite of demand-side strategies is suggested including a cordon pricing scheme for the central city, parking policies which address boundary problems on the cordon perimeter and pricing of major arterials and ring-roads. These policies should be accompanied by 'traffic calming' measures on smaller urban roads. Auxiliary public transport pricing reforms are advocated promoting competition. Current policies of concentrating urban expansion on city boundaries are criticised. The proposed policy mix is a stop-gap bringing congestion closer to efficient levels thereby facilitating transfer to comprehensive electronic pricing.

Comprehensive 'first-best' pricing of Melbourne's roads by satellite monitoring is impractical due to high start-up costs relative to congestion. However, inexpensive demand-side policies can reduce congestion costs. This paper exposit such policies. Section 2 overviews Melbourne's transport system. Section 3 analyses congestion policies emphasising demand-side tactics and cost-effective cordon pricing of the city centre. Supply-side strategies, information policies, indirect demand-side strategies and other policies are discussed. Section 4 outlines a plan to relieve radial and central traffic congestion by curb-side pricing, cordon pricing and 'traffic calming'. Section 5 explains why direct demand-side strategies are generally unsuited to reduce cross-town congestion. Section 6 offers conclusions and final remarks.

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## **Melbourne's Transportation**

Melbourne's sprawling metropolis wraps around Port Phillip Bay, stretching 50 km east to west and 70 km north to south. It is a large city covering 1,700 square kilometres and is home to 3.3 million residents.

Melbourne splits into two zones, a central-cum-inner-suburban region and an outer-suburban periphery. The CBD and inner suburbs were developed during the nineteenth century before the advent of motor transport. The compact CBD has high population density and few high capacity roads. As Melbourne's commercial centre the CBD hosts one third of the city's jobs. On an average weekday over half a million people travel within the City of Melbourne, with sixty-three per cent of these trips by car (City of Melbourne, 2000:4.3). The CBD is the largest retail centre with turnover three times that of the largest alternative free-standing shopping mall (Cervero, 1998:334).

Melbourne's inner suburbs are compact, mostly affluent, residential areas with pockets of commerce and industry. Residents live in high population densities of 45-60 people per hectare, have easy access to local commerce, amenities and the CBD. Because they have convenient access to public transport, they are less car-dependent than those in the periphery (Cervero, 1998).

Melbourne's periphery developed with the urban railway built in the late nineteenth century, which allowed residents to live in large freestanding houses distant from the workplace. This created low-density residential corridors along rail lines. The advent of the motorcar facilitated cross-town travel and land between rail corridors was eventually developed as urban sprawl.

The periphery consists mainly of detached single-family homes with gardens. Residential areas are often segregated from industrial and commercial areas with population densities of approximately 14.9 persons per hectare (pph). These are among the lowest urban densities outside the United States. Montreal and Toronto, cities with similar populations, have population densities of 33.8 pph and 41.5 pph respectively (Department of Infrastructure, 2002:58). The long distances that must be travelled by residents in Melbourne's periphery rule out walking and bicycling while low population densities undermine economies required for mass transit. The periphery has high car dependence.

Since the 1960s Melbourne has experienced high growth in car dependence. From 1961-1991, while population grew 53 per cent and the total road network by 44 per cent, vehicles registered grew 237 per cent and 'passenger boardings' on buses, trains and trams fell 31 per cent (Kenworthy and Laube, 1999).

Of all trips in Melbourne 14 per cent are to work, 10 per cent are education-related, 20 per cent are for shopping and 26 per cent are social or recreational. Many journeys are cross-town (only one third of work-related journeys are towards the city centre and, of these, only one third by public transport) which poses specific problems. However, marginal congestion costs occur predominantly in Melbourne's CBD (59 per cent of the total), followed by its inner arterial roads (20 per cent), freeways (14 per cent) and other arterials (7 per cent) (Litman, 2002).

### *Transport infrastructure*

Public transport infrastructure has evolved as *ad hoc* adjustments to immediate needs at high cost. Responsibility for roads is shared, with the Federal Government responsible for national highways, and 32 Local Governments responsible for tributary roads. The State agency responsible for management of primary and secondary roads is VicRoads.

Melbourne's road network follows a disjointed grid. Each major road forms a grid square composed of tributary roads. Many major cross-town roads do not run the width of the city so drivers need to change roads to make cross-town journeys. The arterial roads were later additions that radiate out from central Melbourne.

Most of Melbourne's roads are not charged for directly and many are congested at peak times. Excluding charges, road users only pay for approximately 44 per cent of the social costs they impose with non-motorists bearing around 32 per cent (Litman, (1999). Motorists do not bear congestion, pollution, noise, road construction, maintenance and external accident costs. Drivers also benefit from fringe benefit tax concessions that favour salary packaging linked to private transport. Where road use is charged for at point-of-use, as on CityLink's Tollway or where it will be practised as on the Mitcham-Frankston Project, it is cost-recovery not efficiency-based. Apart from minor concessions for heavy vehicles travelling late at night and lower rates for passenger vehicles on weekends, there is little differentiation between peak and off-peak tolls.

Melbourne has one of the world's largest urban train networks and the fourth largest tram network. Yet only 9 per cent of motorised trips are on public transport (Department of Infrastructure, 2002:39). Indeed many Melbournians live beyond walking distance to public transport and only a small proportion of jobs can be reached by public transport. Hence, although heavily subsidised, demand for public transport is low. In the past, transport deficits have been over a billion dollars per year or \$1,670 per passenger (Industry Commission, 1994:75-77). Subsidies will be \$2.3 billion over the five years from 2004 (Heasley, 2004).

For many, public transport is an imperfect substitute for car travel being less convenient and more expensive. Public transport, moreover, caters primarily for radial trips, accounting for 36 per cent of such trips compared to 9 per cent of total trips (Department of Infrastructure, 2002:39).

Recently the Government privatised public transport as regulated and subsidised monopolies. The urban train network is operated by the private corporation, Connex, the tram network by Yarra Trams and the buses by several private companies. Trains provide convenient travel to the CBD, where 85 per cent of jobs are located within a five minutes walk of a city-loop station (Cervero, 1998). Melbourne has no cross-town railway lines. Connex currently receives a subsidy of \$345 million per year (Yarra Trams, 2004). The tram network forms a grid covering the inner suburbs, with occasional offshoots into the periphery. The

high patronage of the trams for local journeys is due to the regular services provided and surrounding high population densities. Nevertheless, Yarra Trams receives a subsidy of \$112 million per year (Yarra Trams, 2004).

Buses are concentrated in areas developed after the advent of cars but not serviced by rail or tram. Buses usually travel cross-town to train stations, schools or peripheral shopping centres where they often follow meandering routes through suburbs. Low patronage is due to irregular and slow services reflecting low population densities. There is a lack of financial incentives for operators to seek extra passengers since they are mainly paid on the basis of distance operated with franchises reviewed on a 'grandfather' basis.

#### *Causes of traffic congestion*

Melbourne's congestion results from lack of effective urban planning and transport policy, inefficiently priced transport and urban development subsidies. Supply-oriented civil engineers at VicRoads have dominated transport management focusing on predicting demand at subsidised private transport prices and then seeking to provide infrastructure. Little attempt has been made to manage demand.

Road supplies in central Melbourne are limited because of the high costs of acquiring intensively developed land. Creating peripheral roads makes more sense but raises 'triple convergence' issues<sup>1</sup>, discussed below in 3.6. More roads release latent demands for travel, which tends to restore pre-existing congestion. Thus, providing roads in the periphery reduces travel costs and increases the appeal of cheaper peripheral housing, resulting in urban sprawl, which offsets the benefits of the initial road expansions. Commerce and industry follow residents in locating far from public transport corridors, further increasing demands for cross-town travel.

With rising incomes and declining motoring costs public transport has come to be seen as a poor substitute for car travel. Public transport usage is known to be price-inelastic undermining the effectiveness of subsidy policies.

#### *Traffic congestion costs*

Congestion imposes costs. Increased travel time cuts into leisure and work time with costs at about 50 per cent of a commuter's wage (Small, 1992). Other costs include stress, fatigue and increased costs of fuel and car maintenance. There are also specific costs to the transport services sector, which accounts for 10 per cent of gross product in Victoria. Indeed freight movements within Melbourne cost \$2 billion annually (FDF Management, 2001). Congestion reduces the

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<sup>1</sup> Downs' (1992) *fundamental law of traffic congestion* states that peak hour traffic congestion rises to meet increases in capacity because initial reductions induces users of alternate routes to return (*spatial convergence*); fewer people tend to avoid peak-time travel (*time convergence*); and users of alternate transport modes return to cars (*modal convergence*).

productivity of transport capital by increasing its input requirements. This decreases economy-wide productivity through inefficient use of fuel, automobiles and creating slower, less reliable road-based public transport. Congestion increases emissions of dangerous pollutants because, with congestion, fuel consumption increases by up to 30 per cent (Litman, 2002). Moreover, pollution, vibration and noise caused by congestion decrease the environment's aesthetic appeal.

There are no accurate, up-to-date estimates of Melbourne's congestion costs. Earlier estimates suggest costs of \$2 billion dollars per year (Industry Commission (1994:220) but these are *gross* figures not deadweight losses. They compare travel times with congestion times under free-flow (BTCE, 1996), exaggerating net costs in one sense but understating them by ignoring indirect costs such as pollution. The same gross figures are presented in Port Jackson Partners (2005), which forecasts congestion cost increases from \$2.7 billion to \$8 billion over 2001-2021.

Observed traffic delays suggest there *are* significant deadweight losses to Melbournians from congestion. BTCE (1996) estimates for 1995 suggest deadweight losses of \$466 million. For 2005, assuming (i) 11 per cent population growth, (ii) 23 per cent inflation and (iii) 12 per cent growth in the per capita car fleet size, implies a rough estimated cost of \$698 million. Supply improvements are ignored here as are nonlinearities in the relation between vehicle numbers and travel times. VicRoads estimated travel times on sections of the Westgate Freeway, the Western Ring Road, CityLink and the Eastern Freeway doubled from 1994-2003 (Silkstone, 2004). Further, this estimate ignores growth in vehicle usage intensity: experience suggests substantial increases in intensity reflecting increased travel distances to work (Kenworthy and Laube, 1999).

## **Congestion Policies**

The existence of congestion suggests gains can be realised with active policy. The first-best intervention is to force drivers to internalise all social costs of travel by pricing road use to ensure efficient usage. If this is impractical, potential gains remain possible through policies that *reduce* road use to efficient levels.

Pricing policies must be socially acceptable and easy to use. Controls on road use promote inefficiency while market approaches, relying on price, select out users with maximum willingness-to-pay.

Pricing technologies must also be reliable and flexible enough to allow for fine-tuning and expansion. Tolls should account for the fact that vehicles impose different costs by measuring congestion impacts in terms of passenger car equivalents, so impacts are related to the size of vehicles. Policies also need to account for the difficulties low-income earners face because of lack of transport alternatives to cars.

Efficient pricing, whether exact or approximate, offers a double-dividend. It improves resource allocation and provides a superior source of revenue for States, such as Victoria, that currently depend on, for example, regressive gambling taxes.

Congestion charges will fall heaviest upon the time-poor affluent who often live in congested and polluted inner city areas but will allow the abolition of some socially-costly taxes.

#### *Comprehensive pricing*

The likely availability, within decades, of comprehensive first-best road pricing technology provides leeway for current transport policy. Rather than attempting to internalise all costs now, one can instead look for *stop-gap* strategies to contain congestion until comprehensive pricing is available. Comprehensive pricing remains a longer-term goal.

#### *Kerbside pricing*

Kerbside systems can only address congestion on major roads. These rely on interrogators located next to roads, or gantry points above roads, to pick up signals from transponders or tags in passing vehicles. A computer analyses usage and debits driver accounts to reflect tolls.

Unfortunately such partial pricing creates incentives to divert from priced to unpriced roads. The possibility of 'rat running' (touring around gantry points to avoid charges), implies that, with unpriced substitutes, priced roads should have greater capacity but lower tolls (Choe and Clarke, 2000). McDonald (1995) suggests there are big impacts of unpriced substitutes on gains from efficient pricing with toll revenues being only 25-50 per cent of those without priced substitutes and yielding only 8 per cent of the gains. Given administrative costs the case for efficient pricing can be destroyed with such substitutions. Further, if motorists change destination choices to uncharged locations, congestion itself relocates toward uncharged areas.

#### *Cordon pricing*

The priced cordon reduces congestion by charging an entry fee for access to an area creating economies by monitoring along a perimeter, rather than on individual roads. The entry fee can be varied to capture marginal social costs with payment made electronically by kerbside charges, tollbooths or pre-purchased windscreen stickers. London has recently successfully introduced cordon pricing. The cordon met congestion reduction targets and showed that large-scale road pricing projects can gain reasonable popularity.

Priced cordons can be an efficient way of capturing the social costs of road use because, unlike parking charges, they capture *through* and *terminating* traffic. To minimise adverse distributional impacts on low-income, high travel value citizens, alternative lower-cost public transport should be available for those unwilling to pay the cordon charge.

### *Information*

Transport reform is politically sensitive. A prerequisite is public education on the costs of congestion, the case for transport subsidies and the logic behind demand management. Such information, as a public good, is underprovided. The case for efficient pricing needs to be explained and distinguished from cost-recovery-based construction tolls that fund supply-side initiatives such as CityLink and the Mitcham-Frankston Tollway. Construction tolls target average rather than marginal costs and do not target congestion. They are inefficient if only because they are uniform over the day. They should be higher at peak periods to reflect higher congestion costs.

The popularity of efficient pricing can be improved by *guaranteeing* revenue neutrality by cutting other taxes once charges are introduced. Harrington *et al* (1998) show that when authorities guaranteed taxes collected would be offset by reductions elsewhere, support for road pricing in California rose by 7 per cent.

There remain political economy constraints on reform. Efficient pricing will not appeal to peripheral, car-dependent areas, in politically-important electorates. Huge public transport subsidies may likewise be difficult for citizens to accept. The target of education campaigns is to reduce such barriers to efficient pricing.

While local residents may seek 'free-rider' benefits by leaving roads, such as the Mitcham-Frankston Tollway unpriced, the point should be made that *appropriate* charges would ensure efficient use of this road rather than cost-recovery, and that the same charges will be applied to other major roads. With appropriate redistributions of toll revenues all citizens are better off with such charging.

Finally, giving people choice improves the acceptability of pricing. Harrington *et al.* (1998) show that restricting pricing of a road to a single lane, leaving a more congested alternative to those wishing to avoid tolls, increases support for pricing by 9-17 per cent.

### *Non-congestion externalities*

Motor transport produces by-product and congestion externalities including pollution, noise, vibration, accident risk and the aesthetic degradation of neighbourhoods. These costs are roughly proportional to the distance a vehicle travels and its weight, which is most conveniently related to fuel consumption. A fuel surcharge can internalise such externalities for urban if not non-urban commuters although, even for urban commuters, surcharges are blunt because of variations in engine efficiency. United States studies suggest policies that fully internalise these externalities can double motorist private variable costs (Litman, 1999:3). Such charges have a non-specific congestion impact.

### *Supply-side measures*

Although popular with politicians and engineers, supply-side strategies cannot, in themselves, resolve congestion in the long-term. This is demonstrated by the

persistence of congestion in cities, such as Los Angeles, even given considerable supply-side investment. Increasing road supplies to the point where demand never exceeds supply is impractical in congested cities, given difficulties in scaling-up road capacity to keep pace with growth in travel demands. Supply measures are *at best* an expensive form of congestion relief. Their appeal stems from free-rider externalities and the absence, until recently, of cost effective technology to charge for road use. Individual motorists derive specific benefits from new roads but, as with public transport, costs are borne by the *average* taxpayer. Increases in road supply have weak effects on pre-existing congestion because of 'triple convergence' issues. The effective way of avoiding these adverse effects is to address congestion directly by charging.

#### *Indirect demand-side policies*

If it is technically and politically difficult to directly internalise congestion costs, one can set charges on goods complementary to private car use such as fuel, registration, parking, stamp duty, spare parts and, indeed, car prices themselves. Charging for complements increases motoring costs and lowers demands for private motorised trips. Such charges can focus on usage, and perhaps location, and should reduce fleet sizes. However, this approach does not specifically address congestion and creates inefficiencies by leading to under-utilisation of uncongested roads.

Indirect charges can target fuel (or even spare parts usage) which is roughly proportional to distance, pollution and risk. Since elasticities of usage with respect to fuel is low this implies low deadweight losses but, to significantly impact on external costs, fuel taxes must be high. Currently about half of gasoline costs accrue to government. Such charges proxy for maintenance, environmental and health externalities and encourage purchase of fuel-efficient vehicles. They only marginally target congestion. Such policies impose costs on all drivers regardless of the valuation or location of travel resulting in inefficiently few journeys. Increasing spare parts or new vehicle charges might undermine traffic safety as drivers postpone repairs or vehicle upgrades.

Fuel charges can be designed so heavily congested areas get charged most, but this requires large distances between congested and uncongested regions to prevent inefficiencies such as 'fuel fetching' (driving to distant locations to purchase fuel). It is impractical to levy such indirect charges in Melbourne.

Another approach is to levy charges on city parking that is related to the social costs of car travel. Parking charges can be peak-load priced to internalise social costs of peak hour travel but to not impact as much on travel at other times. However, parking charges increase congestion by encouraging motorists to roam in search of low parking fees and increase chauffeured and 'through' traffic.

#### *Alternative transport*

Alternatives to private road transport include walking, bicycling, use of jitney, taxi, bus, tram or train. These alternatives may not compete with cars because cars

offer space, time and route freedom and because many of the costs cars generate are external. Attempting to reduce congestion by subsidising alternative transport modes requires high cross-price elasticities of substitution which are, in fact, low. Subsidies themselves are 'first-best' policy prescriptions for industries dominated by large fixed costs, such as railways, where economies of scale are significant. However, if costs are primarily variable, subsidies imply inefficiencies because use then becomes inefficiently high.

While information on using congestion-inducing private cars to travel is a private good, information on congestion-efficient vehicles, non-motorised travel and public transport is a public good that may be under-provided. Marketing campaigns, such as the City of Perth's 'Travel Smart' program, which informs travellers of the costs associated with travel decisions, can modify transport demands by moral suasion.

If congestion charging is introduced some travel would shift to subsidised public transport. This operates at close to capacity at peak times, so road pricing reform calls for increased provision and subsidies. Only when *all* urban transport is efficiently priced at social marginal cost will citizens bear the cost of their travel choices and travel and locate their residence, workplace and recreational activities efficiently.

The extent to which public transport should be subsidised depends on scale economies and externalities. Infrastructure (rails, roads and signals) are a natural monopoly subject to scale economies but rolling stock is not. Vehicles can be operated by relatively small, independent, unsubsidised, unregulated firms. Indeed firms can operate on the same routes, offering close substitute services. What is objectionable is not government enterprise *per se* but lack of competition. Privatised monopolies need be no more efficient than government monopolies and efficiency can fall with only limited competition as network effects are undermined by removing central coordination. This is particularly so if strong unions remain and since the Melbourne privatisations, union membership has risen after large falls in the 1990s (Masanauskas, 2002). Also with only a few suppliers, cartels form to inhibit competition.

With government regulation, regulated monopolies or oligopolies merely add to the list of special interest groups trying to rent-seek. This has been the liberalisation experience of the Chilean and English bus services. The Chilean bus service was deregulated in 1979. Bus companies quickly formed cartels to exploit the Government's absence from the market, service levels deteriorated, prices increased and traffic congestion dramatically increased. The only beneficiaries were the cartels. The English bus service suffered a less severe fate than the Chilean, when it was deregulated. Service levels deteriorated and adverse network effects occurred as common ticketing disappeared so prices increased leading to increased traffic congestion (Mees, 2000). Some might argue that 'Demsetz competition' involving exclusive licenses that are periodically re-tendered may work better than open-slather competition.

Note the equity implications of subsidies. While public transport is used mainly by the less affluent, some beneficiaries of subsidies are radial commuters

heading toward well-paid CBD and inner city jobs. Others, less affluent tend to commute across-town to jobs in the periphery using private vehicles. The distributional impacts of subsidies must be calibrated. Providing such information is a research priority.

Finally, note that the benefit of public transport subsidies and regulation is absorbed by declining productivity as strong unions pursue excessive wage rises and bloated management structures continue to allow inflexible working conditions and over-investment in uneconomic services and infrastructure. In short, interest groups rent-seek imposing a burden on the majority of Melbournians who rarely use public transport. The best protection against such rent-seeking is competition.

### *Urban planning*

Policy can seek to increase population densities in areas served by transport corridors. This reduces required private vehicle travel and increases demand for public transport. However, over the next thirty years, most of Melbourne's new urban growth is planned for the fringe districts of Melton, Casey, Wyndham, Whittlesea and Hume (Department of Infrastructure, 2002) so population densities will hardly alter given current urban designs.

Clustering retail, employment, cultural and social institutions together in peripheral residential suburbs that are well served by public transport, can promote alternatives to the private car. However, this has not been the case with suburbs such as Box Hill, a large employment hub with 15,000 workers. While well-served by bus and train, only around 7 per cent of its workers use public transport (Cervero, 1998:328). Moreover, creating large commercial developments in residential suburbs, to reduce traffic pressures, can encounter local community opposition as public protests on developments in the Camberwell Station area highlight.

### *Traffic calming and other policies*

Traffic calming involves slowing traffic to make streets safer and more useful for general residential life. This is achieved by altering road widths, reducing speed limits, building road obstacles such as speed bumps, and by encouraging slower driving. By adding street furniture and vegetation to make the environment visually attractive and less car-oriented, traffic calming reduces external costs of car use and accidents. It also limits local traffic flows and spill-overs onto local roads from the pricing of major roads alone. Even though calming reduces 'rat-running' and improves amenity values, it imposes costs by slowing down local traffic, increasing fuel costs and so on.

Other policies include *ride-sharing* which has the potential to reduce congestion by reducing the number of vehicle trips. This requires common origins, destinations and travel times. High occupancy vehicle lanes encourages ride-sharing by restricting supply which, however, has some effects in worsening congestion.

Introducing greater *flexibility in working hours* reduces travel demands during peak periods but also reduces the coordination benefits from synchronisation of work hours. Triple convergence will offset many flexi-time strategies and such strategies would need to be organised city-wide to significantly reduce congestion. With increasing use of mobile phones and the internet this may become more feasible, perhaps by allowing work one day a week from home. Another way of re-organising times to reduce congestion is to alter school hours to allow chauffeured trips to school to be carried out further from peak times.

*Park- and- ride* facilities allow travellers to drive to public transport, park and then transfer to public transport. Melbourne exploits park-and-ride, with over 23,000 car spaces provided near stations in addition to on-street parking (Mees, 2000:231).

Finally, *upgrading tow-truck procedures* by introducing roving recovery vehicles can reduce accident-induced congestion delays.

### **CBD and Radial Traffic Reforms**

Melbourne's most intense congestion occurs on radial and central roads which should be addressed by kerbside and cordon pricing, respectively. Such policies are simple and user-friendly with electronic monitoring allowing tolls to be levied at low cost. These policies do not interfere with traffic flows and pricing can be varied to reflect short-run social costs. While impacts are concentrated on high-income, high time valuation city-based workers, adverse distributional impacts, where they do occur, can be negated using compensations from toll revenues. Indirect demand-side strategies, such as traffic calming, can minimise boundary problems.

#### *Motorway pricing*

Melbourne's radial motorways (Eastern Freeway, South-Eastern Freeway, Calder Freeway, West Gate Freeway, Princess Freeway, Western Freeway, Tullamarine Freeway, Hume Freeway and CityLink) spread from the city centre like spokes on a wheel. They are intended to provide high speed uninterrupted access to the city from the periphery but are congested during peak periods. These motorways are suited to kerbside pricing since their high traffic volumes justify the transaction costs involved and alternative roads can be managed as imperfect substitutes. The limited number of entry and exit points minimises the gantries required for monitoring. Indeed motorways would only require about ten gantry points, many of which could be strung from bridges.

The CityLink road network is the only free-flowing axis linking the South-Eastern Freeway, West Gate Freeway, Tullamarine Freeway and Melbourne's ports. It is inefficiently priced with excessively high tolls leading to low patronage and excessive congestion on neighbouring substitute roads.

Melbourne already has experience with the technology, management processes and enforcement required to implement road pricing, via CityLink. This

technology has a high capture rate, needs little space, causes low environmental impact, has low fixed staff costs and low marginal costs. Gantry points, though expensive, can be minimised because of the limited entry/exit points: see Table 1 below. Melbourne residents are familiar with this technology. Many residents already have an E-tag and scope exists to create economies of scale in road pricing management by outsourcing management of new arterial roads to firms such as CityLink.

**Table 1: Arterial and Cross-Town Roads that Can be Priced in Melbourne**

<b>Existing roads with construction tolls</b>	<b>Approximate number of entry/exits</b>
Monash Freeway	15
Link Road	8
Bateman Avenue	2
Burnley Tunnel and Grant Street	2
Mitcham-Frankston	Under construction
<b>Roads not yet tolled</b>	<b>Approximate number of entry/exits</b>
Eastern Freeway	10
Western and Eastern Ring Roads	17
West Gate Freeway	7
Tullamarine	10
Calder	9

### *Cordon pricing*

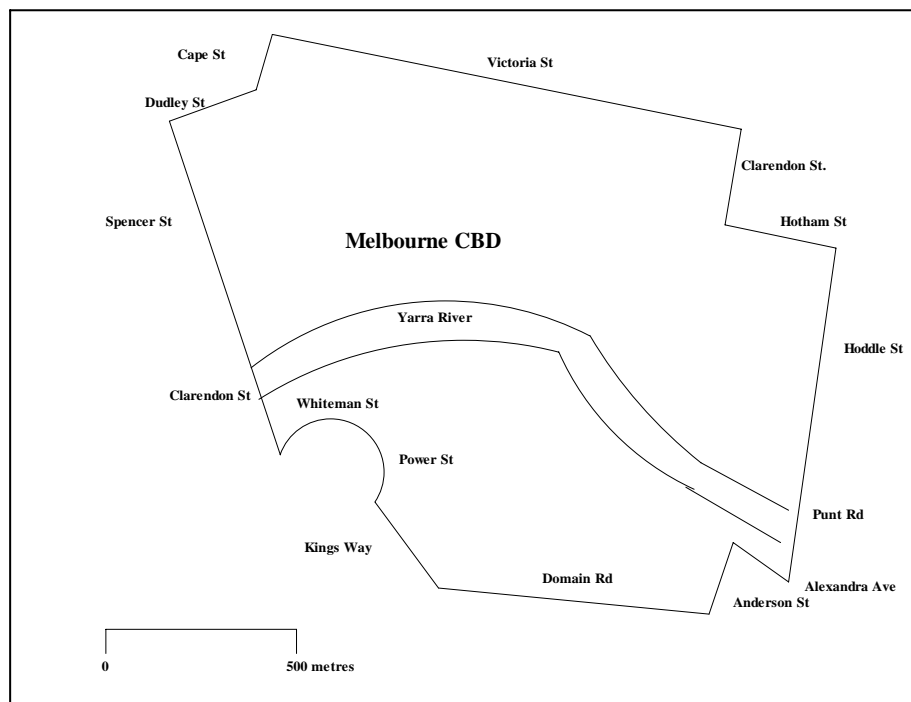
Cordon pricing operates with the same logic as kerbside systems but has the advantage of offering economies by monitoring road use only at the periphery of an area rather than monitoring each individual road within an area.

Melbourne's cordon should cover Melbourne's CBD up to, but not including, Victoria St, diverting down Clarendon St and Hotham St, running down Punt Rd, down Alexander Ave to Anderson St, Domain Rd, across St Kilda Rd to Park St, then down Kings Way, Sturt St, Power St and along Clarendon/Spencer St, up Dudley St around the inside of Victoria market and returning to Victoria St. Areas such as the Crown Casino car parks should lie inside the cordon to prevent motorists parking there and walking in thereby creating congestion on the cordon

boundary. Boundary problems are further minimised by positioning the periphery within commercial and industrial areas that have significant parking restrictions and rigorous enforcement.

A plan of the proposed cordon is in Figure 1. This design captures most of the congested core and requires only about twenty gantry points so start-up costs are well below London's £200 million cordon, with its over 200 entry and exit points.

**Figure 1: The Proposed City Cordon**



Through traffic can bypass the cordon by running around perimeter roads or using CityLink. Public hospitals, schools, and most emergency services remain on the periphery of the cordon, reducing claims for charging exemptions. The cordon excludes the entertainment and shopping precincts of Lygon St, Brunswick St, Victoria St, Toorak Rd, Swan St and Docklands and the shopping precinct of Victoria Market.

Because Melbourne's centre also has tight parking restrictions it does not need to adopt an *area cordon*, like London, where cars are billed merely for being on city roads. Rigorous enforcement of parking restrictions allows Melbourne to operate a *periphery cordon* where drivers are only charged for *crossing* the cordon boundary. This internalises the social costs of trips out of and across, the cordon

better reflecting social costs of using roads. As no substitute roads exist, the cordon charge accurately reflects marginal costs of using city roads. The charges should vary to reflect the social cost of road use depending on travel time and vehicle type allowing a more efficient allocation than London's single price.

Unlike London, Melbourne should not exempt taxis, motorcycles, mopeds, buses, recovery vehicles, repair vehicles and alternative fuel vehicles, as all contribute to congestion. All vehicles should pay the external costs inflicted. Motorcycles, mopeds, taxis and alternative fuel vehicles impose lower costs and this should be reflected in charges. Taxis and buses impose congestion so tolls levied should reflect this. The cordon charges internalise external costs associated with using city roads leaving parking charges directed to capture the additional specific costs of parking.

### **Cross-town Traffic Strategies**

Improving the efficiency of cross-town travel is a challenge. The economies of scale that allow direct demand-side strategies for radial travel and within the CBD rarely exist in the sprawling plethora of cross-town roads. Yet serious congestion occurs on cross-town roads such as Springvale Road. This is 20 kilometres from the city centre and provides the main north-south road link in Melbourne's Eastern suburbs. A survey of 7,500 RACV members nominated the intersection of Springvale and Whitehorse Roads as the worst congestion in Melbourne. The next five most nominated sites were also in outer metropolitan areas (<http://www.racv.com.au/road/redspot/redspot.asp>).

Rail infrastructure is primarily radial as population densities necessary for mass transit are unavailable for cross-town journeys in the periphery. Land-acquisition costs limit the potential for supply-side measures so policies are limited to indirect demand-side tactics and occasionally, when traffic volumes permit, to direct demand measures.

#### *Roads*

Melbourne's cross-town roads generally do not run the length of the city, have relatively low capacity, and are frequently interrupted by intersections. The only arterial road that currently allows uninterrupted cross-town travel is the Western Ring Road. A significant expansion of cross-town road supply is impractical given land acquisition costs.

Cross-town roads are unsuited to *direct* demand-side strategies. Their price elasticity of demand is high, as close substitutes exist. Also, because entry/exit points frequently interrupt such roads, the number of gantry points required for monitoring would be expensive. Road capacities are low so the scale required for viable road pricing is not present.

The Western Ring road and the soon-to-be-constructed Mitcham-Frankston tollway are the only cross-town roads with sufficiently high patronage and with

the limited number of entry/exit points required to enable kerbside pricing. Charges should be set below first-best levels since some substitute routes do exist.

While cross-town travel can never be as efficiently managed as radial travel, it has the advantage of imposing lower congestion. Cross-town commuters on average have a lower value of time than inner city workers so the costs of congestion are lower.

With comprehensive road pricing, decisions about expanding existing roads and building new roads can be more informed. If road segments remain congested despite high pricing — in short, when they are earning good profits after accounting for all costs associated with their operation — there are grounds for expansion.

### *Integrated urban and transportation planning*

An urban growth boundary can limit Melbourne's transport problems in the city periphery. Restricting expansion halts encroachment into fringe wilderness, agricultural land and public amenity areas. Some of these resources — for example Greenbelt areas conserving biodiversity — are public goods and will be underprovided even if congestion and other externalities are internalised. Imposing a boundary encourages the development of viable satellite and regional cities as substitutes for sprawl. By increasing population densities, public transport and ride-sharing become increasingly viable in the periphery.

Unfortunately most population growth has occurred and is forecast to continue to occur on city fringes where it will be channelled into 'growth corridors' (Department of Infrastructure, 2002). Between the 1996 and 2001 censuses Melbourne's population grew more than 7 per cent with more than half of this reflecting residential growth in outer suburbs such as Caroline Springs in the west, Roxburgh Park in the north and Narre Warren South in the south-east. Only 12 per cent has occurred in the local government areas of Melbourne and Port Phillip (ABS, 2003). The State Government sees intended corridors being serviced by radial transport via the *Transit Cities* component of its *Melbourne 2030* plan (Department of Infrastructure, 2002). This encourages new development, housing, schools and shops near railway stations. However, since car travel in fringe suburbs is primarily cross-town this strategy is unlikely to be effective.

There are criticisms concerning the use of land use policies to address congestion issues. Some claim such policies have a 'tail wagging the dog' character. The objective is to make travelling efficient, *not* to limit it through restrictions on city size. However, given difficulties in applying efficient road pricing in low-density urban areas, land-use restrictions are a sound 'second-best' policy. Sometimes too, the imposition of urban boundaries is seen as impractical policy that will be undone by politicians in response to interest group pressures and, indeed, this seems to have already occurred in Melbourne's west. The answer is to set boundaries that give room for current land-owners to realise

expected capital gains on long-term land holdings or provide financial compensation for lost property values as a result of greenbelt-type policies.

The inner suburbs in Melbourne have a mass transit-oriented public transport system. This allows for quality travel in all directions at virtually all times, as opposed to commuter public transport which only allows for efficient radial commuting at peak hour (Mees, 2000). Internal growth boundaries need to be developed to restrict high-density housing to transit-friendly locations within inner and surrounding suburbs. Reducing building and heritage regulations here would allow more people to live closer to areas of high employment and increase access to transit-oriented public transport.

### *Public transport*

Government subsidies and regulation have not delivered a public transport system that efficiently services cross-town journeys in the periphery. Government regulated monopolies face information problems in attempting to cope with the dispersed times, points of departure and destination characteristic of cross-town travel. There is not enough 'mass' to make mass transit work so more specialised transport services are needed. Deregulated markets may offer superior outcomes and better coordination than centralised planning. Numerous unsubsidised and largely unregulated firms, with access to common infrastructure, may offer a superior solution to the dispersed travel requirements of cross-town travellers. Trams, buses, jitneys and taxis could provide substitute services. Competition would keep prices low while market forces would encourage wage discipline, reward good management, creativity, improved customer service and product differentiation. As an example, the Queens Van Plan, in poor areas not serviced by public transport in New York, receives no subsidies and charges patrons a flat \$1 fee per ride (Winston and Shirley, 1998).

Government could focus on providing infrastructure, preventing anti-competitive behaviour and ensuring safety standards.

### **Final Remarks**

Traffic congestion in Melbourne is a consequence of inefficiently priced transport services which lead to inefficiently high traffic demands. Little attempt has been made to even collect and collate appropriate data on the deadweight losses of congestion or the changes required to drive road use toward designed capacities. A component of any research strategy should be provision of this data. Research should also address the distributional implications of alternative transport pricing regimes and the issue of scale economies in public transport provision.

Melbourne, along with other cities, has consistently favoured supply-side solutions which impose costs on all taxpayers regardless of their travel decisions. These strategies have electoral appeal since consumers are largely unaware of the scale of the non-internalised travel costs and of the case for subsidising well-managed transport businesses with scale economies that generate positive

externalities. A second priority is to devise campaigns highlighting the benefits of demand-side strategies.

The first-best solution is to reduce traffic to socially efficient levels by comprehensive road pricing coupled with marginal cost pricing of public transport. This is currently infeasible but should remain a long-term objective.

Cost improvements will stem from adopting a suite of direct and indirect demand-side strategies. By-product externalities should be internalised through externality taxes on fuel, and variable registration and insurance charges. Arterial and CBD roads should be priced. Pre-setting urban boundaries would increase population density while internal growth boundaries would focus development, reduce travel, and increase numbers of people with convenient access to public transport. Public transport must be priced to encourage efficient modal substitutions.

A suite of demand-side strategies has the potential to be more efficient and fair in reducing traffic congestion than Melbourne's current traffic management system.

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